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(54) SELF-HEATING DEPILATORY PACKAGES

(71) We, COLGATE-PALMOLIVE COMPANY, a Corporation organised and existing under the Laws of the State of Delaware, United States of America, of 300 Park Avenue, New York, New York 10022, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to depilatories and provides a package which dispenses a self-heating depilatory which, on application to the skin as a warm form, immediately acts to enter the hair follicle, speeding the chemical reaction there, by which the hair is weakened and dissolved. Thus, the self-heating depilatory acts in a dual manner, in that in addition to being more comfortable upon application to cold-sensitive portions of the body, it also speeds the depilatory action and makes it more effective.

According to the present invention a package for dispensing a self-heating depilatory comprises depilatory compound constituents stored in separate zones of the package, in one of which zones there is present a chemical compound which is exothermically reactive with another chemical compound to form an active depilatory compound, and in the other of which zones there is present the other chemical compound, and means for dispensing the contents of both zones from these zones and into contact with each other (and other depilatory composition constituents which may be present) to produce a heated depilatory.

Preferably the reactive chemical compounds form a thioglycolate. In addition to or in partial replacement thereof, other separately stored exothermically reactive chemicals may be employed to heat the depilatory being dispensed.

Various means may be employed for holding and maintaining separate various components of the depilatory composition until the time when dispensing is desired. For instance, various "aerosol" or pressurized dispensers may be employed, in which depression of a spout or valve member allows the internal pressure of a compresed or liquefied gas in a main container compartment to dispense contents from that compartment and from a separate compartment inside the container through valve members and to the atmosphere, usually through a mixing dispensing spout. The proportions of materials dispensed are regulatable by orifice sizes, valve openings, dip tube bores, relative material viscosities, or by other known physical means. In some cases it may be possible for the user to regulate to some extent the proportions of materials being dispensed.

Usually, the material of construction of the main container is tinplate or steel coated with a resin which is impervious to attack by a liquefied gas and other constituents of the pressurized product. The other zone in the dispenser is ordinarily bounded by the walls of a plastic bag, sac or other compartment, which walls are responsive to the liquefied gas pressure, so that the sac volume is diminished as contents thereof are dispensed. Instead of employing a container having two separate compartments, more than two may be used but consideration should be given to the expense involved and the question of whether it is warranted by the effects obtained. Thus, three or four separate compartments may be employed together with auxiliary valve and dip tube elements. Also, it is possible to utilize separate aerosol dispensing containers arranged in such a manner as to allow simultaneous dispensing of contents thereof into a common mixing chamber or through a common spout.

Although various depilatories may be employed in practicing the present invention, the most preferred are thioglycolates. These include salts of thioglycolic acid and various equivalent derivatives thereof, especially the alkali metal, alkaline earth metal, ammonium, amine and alkanolamine salts. Examples are sodium thioglycolate, potassium thioglycolate, calcium thioglycolate, magnesium thioglycolate, ammonium thioglycolate, triethanolamine

thioglycolate, diisopropanolamine thioglycolate and dimethylamine thioglycolate. Such salts may be made by simultaneously dispensing thioglycolic acid from one compartment and the corresponding base, e.g., sodium hydroxide, calcium hydroxide, ammonium hydroxide or triethanolamine, from another compartment, the two compositions mixing and reacting with each other in the dispensing spout or a supplementary mixing chamber. The thioglycol acid is preferably in aqueous solution, as are the various bases employed. In cases where the bases are not sufficiently soluble, dispersions of very finely divided particles may be used but in such situations care should be taken to ensure that the particles are satisfactorily suspended before dispensing.

Although the heated thioglycolate produced by the neutralization reaction may be dispensed alone, it is generally preferable that other depilatory constituents be employed with it. A supplemental heat-generating acid or other material may be employed. Usually, if such an acid is employed, it will be stored with the thioglycolic acid. The presence of such an acidic component serves to assist in stabilizing the thioglycolic acid during storage, in addition to providing additional heat when dispensed, by reaction with the base used to neutralize the thioglycolic acid. Salts formed from such additional acids may also serve as buffers, to promote maintenance of a desired pH in the product. Organic or inorganic acids may be employed. Of the organic acids, mono- and dicarboxylic acids having a carbon content of from 1 to 20 carbon atoms per molecule may be used, although it is preferred to use the lower molecular weight acids, such as those having from 2 to carbon atoms per molecule, including acetic acid, succinic acid, lactic acid, propionic acid and mixtures of such low molecular weight acids. If higher molecular weight acids are used, possibly mixed with lower molecular weight acidic materials, neutralization thereof will produce soaps which are useful in the manufacture of foaming depilatories, especially if the base employed is an alkanolamine. Inorganic acids that may be used include sulphuric acid, hydrochloric acid, phosphoric acid, boric acid and other suitable essentially non-toxic acids. A consideration in the selection of acid-base combinations is the quantity of heat generated from the reaction per unit weight of reactants. Those reactions in which greater quantities of heat are produced are preferred. However, the various acidic materials used should be compatible with the depilatory composition constituents.

To improve the ease of the depilatory intimately contacting the hair and softening it as deeply as possible, a surface active compound will be a usual constituent of the depilatory compositions. Its presence is not essential but it is helpful in making a product of best activity. Products that contact the skin might sometimes be slightly irritating to it and it has been found that such irritation is minimized if the surface active agent employed is a salt of an alkanolamine, rather than the usual salt of an alkali metal. The presence of an alkanolamine salt in the depilatory composition seems to counteract irritations to some extent, rather than to cause them. In this respect it has a desirable effect on compositions containing cations that under some circumstances might be considered to be irritating, such as alkali metals.

The surface active agents may be anionic detergents, such as higher fatty alkyl sulphonates, higher fatty acid monoglyceride sulphates, higher fatty acid isethionates, higher fatty acid N-methyl taurines, higher alkyl aryl sulphonates or higher fatty acid soaps. Of these compounds, it is preferred to use those in which the higher fatty alkyl or acyl group is of 12 to 18 carbon atoms and in most instances the straight-chain materials will be best. Generally, the presence of an aromatic ring in the compound is to be avoided because such materials have sometimes been found to exert a drying effect on the skin. Nevertheless, in the presence of emollients in the composition, such material may be used and sometimes are employed because of their excellent wetting and detersive properties. The corresponding lower acyl or lower alkyl substituted materials may be employed in place of the higher analogous and sometimes result in even better surface activity. Such compounds will have lower alkyl or acyl groups of 2 to 6 carbon atoms. If desired, mixtures of higher and lower acyl or alkyl compounds may be employed.

The presence of a surface active agent is desirable to promote contact of the active depilating agent with the hair and to allow penetration of the latter agent to the hair roots. It is also useful to aid in creation of a foam where, as in most instances, such is desired. Furthermore, such material actively aids in maintaining an emulsion of the depilatory constituents in the dispenser before discharge of the contents. Additionally, it serves to maintain a uniform solution or emulsion of other cosmetic constituents and adjuvants, so that the materials being dispensed are homogeneous. In this respect, it has been found to be especially desirable also to utilize nonionic surface active materials. These will usually be esters or others of poly lower alkylene oxide lower alkanols, the esterifying or etherifying group being either a higher alkyl, higher acyl or alkyl aryl radical of at least 10 carbon atoms, usually of 10 to 20 carbon atoms. From 2 to 40 lower alkoxy groups will usually be present and the lower alkoxies and lower alkanoals are of 2 to 4 carbon atoms. Other recognized equivalent nonionic surface active agents may also be used.

The propellant may be any suitable pressurized gas or equivalent means but it is preferred to utilize a pressurized gas capable of creating a pressure of from 20 to 100 pounds per square inch, most preferably from 30 to 45 lbs/sq. inch. Such pressure can be obtained by utilizing a mixture of liquefied gases or by pressurizing a gas to the required degree. Although nitrogen, carbon dioxide, argon and other inert gases, even oxygen, may be employed in suitable circumstances, usually liquefiable hydrocarbons or halogenated hydrocarbon will be used.

These include the lower hydrocarbons of 3 or 4 carbon atoms, such as n-butane, isobutane and propane, which are preferably employed as mixtures. Most preferably, a mixture of isobutane and propane will be used. It has been found that excellent mixtures of this type are those which comprise from 75 to 95 parts of isobutane and 5 to 25 parts propane, and most preferably 85 to 90 parts isobutane and 10 to 15 parts propane. Halogenated hydrocarbons are preferably those which are at least partially fluorinated, but in some circumstances non-fluorinated halogenated hydrocarbons may also be employed, usually as diluents. Suitable liquefiable gases include monochlorotrifluoromethane, dichlorodifluoromethane, trichlorotrifluoroethane, dichlorotetrafluoroethane, monochloropentafluoroethane, trichloromonofluoromethane, tetrachlorodifluoroethane and similar chlorofluorohydrocarbons, usually having one to three carbon atoms per molecule. These may be used as mixture, to obtain the desired properties in the final product, such as pressure, solubilizing properties, corrosion prevention and emulsion formation.

In addition to the active depilating material, water, surface active agents and propellant, the depilatories of this invention may contain various adjuvants to improve the aesthetic or other properties or to make the composition especially useful for particular purposes. Thus, perfumes, dyes, pigments, emollients, solvents, thickeners, solubilizers, humectants, buffers, antiseptics, foaming agents, preservatives and corrosion preventives may be employed. Usually the proportions of such materials are no more than 5% of each, preferably less than 2% and most preferably less than 1%. The total of adjuvants will be less than 25% of the final packaged product and will generally be less than 10% and most preferably, less than 5% thereof. Among the additives that may be employed are foaming agents such as the alkanolamides, e.g. coconut oil fatty acids diethanolamide and diisopropanolamide; emollients, humectants or solvents such as polyhydric alcohols of 3 to 6 carbon atoms per molecule, having 3 to 6 free hydroxyl groups per molecule, e.g. glycerol, propylene glycol sorbitol, pentaerythritol, cetyl alcohol and stearyl alcohol; skin treating or conditoning agents, such as lanolin or derivatives thereof; perfumes, such as those designed to counteract or mask any objectionable sulphide or mercaptan odour which might develop, such as those containing camphoraceous compounds, eucalyptol, diphenyl oxide, ionines, linalyl acetate, citronellol and geranion derivatives; gums or thickeners, such sodium carboxymethylcellulose, hydroxypropylmethylcellulose, polyvinyl alcohol, hydroxymethylcellulose, gum tragacanth, karaya gum, guar gum and alginates; and fillers, where applicable, e.g. chalk, kaolin, bentonite and talc.

For maximum effectivness as a depilatory and for minimizing objectionable odours, the compositions dispensed should have a relatively high pH. For speediest depilation without excess alkalinity which would irritate the skin objectionably, the pH should be from 9.5 to 12.8. Usually the pH will be between 10 to 12.5, and preferably it will be 11 to 12.5. At such pH's, with the present formulations, depilation will take place within 1 to 10 minutes and usually will take place in less than 5 minutes, e.g. from 3 to 4.5 minutes. The speed of the reaction is aided by the presence of the alkali required for producing a high pH, and because of the ease with which the chemical reaction with the hair and softening and gelatinization thereof occurs, the higher pH's can be tolerated by the skin for the short periods of time involved without causing objectionable irritation. The pH developed is controlled by the choice of particular alkalis and acids to be employed and by adjustment of the proportions of the alkaline materials and acids. The various salts made in the neutralization reaction may also serve as buffers to maintain the pH in the desired range.

Although the thioglycolates are highly preferred depilatories, various other depilating compounds are also operative. Metal sulphides, alkaline solutions of soluble stannites and titanates, e.g. calcium sodium titanate and thallium acetate, the alpha and beta isomers of thioglycerol, low molecular weight simple mercaptans and thiols, preferably having polar groups thereon, e.g. dithiothreitol, mercaptoacetic acid, and other aliphatic mercaptoacids, preferably of 2 to 6 carbon atoms per molecule, may also be used. Preferably, these depilating agents are employed in supplementation of the thioglycolate but they may be used alone. Heat may be generated by any of the mechanisms previously mentioned, although neutralization is highly preferred. Combinations of other depilating agents with thioglycolates and combinations of heat-generating systems can be used. In some instances the thioglycolate may be eliminated entirely, as when another good depilatory is employed and a satisfactory product can result.

The proportion of the various materials employed in the depilatories should be those sufficient to give the desired effects. Thus, the proportions of acid and base of other heat-generating mechanism components should usually be such as to heat the depilatory being dispensed to a temperature within the range of 100° to 160° F, preferably to 120° to 150° F, and most preferably to 130° to 145° F. At such temperatures, the depilating material will be brought into contact with the hair at as high a temperature as can be comfortably borne by the user and at such a temperature the depilating agent will be most active. The increase in temperature of the depilatory over room temperature will usually be from 30 to 100° F and most often this increase will be 60 to 80° F. However, when the particular circumstances demand it, formulations to produce other temperatures can be made.

To generate sufficient heat, while still having satisfactory depilating activity without unnecessary irritation, it will sometimes be desirable to utilize an auxiliary heat generating agent. Such agents are preferably materials that will react by a neutralization mechanism to produce a compatible salt, e.g. alkali metal hydroxides and organic acids. However, there may be employed sulphites, which are oxidized with per-compounds, sulphinic acids, which are oxidized with hydrogen peroxide and neutralised to sulphonates, and thiodialkanols, such as 2,2'-thiodiethanol which is oxidized with hydrogen peroxide or other per-compound to the corresponding sulphoxides or sulphone. In utilizing such materials, they should be so compounded with other depilatory agents as to minimize undesired reactions before the intended dispensing.

The proportion of active depilating agents in the compositons will usually be between 1 and 25%, preferably between 2 and 20% and most preferably between 5 and 15%. Of course, with the more active materials, the lesser of these amounts may be employed and with the less active depilating agents, more will be used. In some applications, where it may be desired to add moisture to the depilating agent after it is dispensed, greater quantities of such material may initially be present in these compositions. The supplementing chemicals to generate additional heat may amount to up to 25% or even more of the formulation. Preferably, the amount will be kept relatively small, such as from 5 to 15%, but proportioned taking into account factors such as the exotherm and compatibility.

The surface active materials employed will usually be from 1 to 30% of the composition, preferably from 2 to 25% and most preferably from 10 to 20% thereof. In any case, the proportion used should be sufficient to maintain homogeneity of the portion of the product in which it is present, which will usually be the major depilatory portion. Furthermore, the amount used should have satisfactory wetting properties and should aid in the production of a foam, when it is desired. Of course, where foams are not desired, one might add a silicone or other antifoam agent.

Although other means of bringing the thermogenic reactants together may be used, ordinarily there will be employed a gaseous or liquefied gas propellant, previously mentioned. Relatively small quantities of such materials will be sufficient to expel satisfactorily the different components of the depilatories. Thus, usually from 2 to 25%, preferably from 5 to 20% and most preferably from 6 to 15% of presurized gas or liquefied gas propellant will satisfactorily dispense the depilatory constituents from the compartments of the usual container or plural containers used together, without an unacceptable diminution of pressure. A dispensing pressure will usually be from 20 to 100 p.s.i. (pounds per square inch) and preferably will be from 30 to 45 or 50 p.s.i.

As a solvent and dispersion medium for the present depilatories water is highly satisfactory. In some instances it may be useful to add supplementing solvents, such as lower alcohols, e.g. isopropanol or ethanol; ketones, e.g. acetone; hydrocarbons, e.g. deodorized kerosene; or polyols, e.g. glycerol or polyethylene glycol. These will not usually be needed but they may be employed for special effects. The percentage of water in these compositions may be from 10 to 90%, preferably from 20 to 80% and most preferably from 40 to 70%.

Because thioglycolic acid is a reducing agent, usually it should not be compounded with chemicals which are oxidizing. Otherwise, the reducing effect thereof could be lost before dispensing and application to the hair. Of course, chemicals which tend to neutralize the thioglycolic acid should also be kept separate from it until the time of dispensing. It has been found that stable formulations may be obtained by using acetic acid or another lower alkanoic acid as an extra thermogenic material and by utilizing triethanolamine higher linear alkyl sulphonates as surface active ingredients. With the "acid component" portion of the system one may employ supplementing thermogenic agents, such as higher alkyl sulphinic acids, sulphites, thioureas, barbiturates and other such compounds which will generate heat when reacted with the "basic component" or other reactants that can be used. With the basic material, which usually will be an aqueous solution of sodium hydroxide, generally of concentration between 10 and 50%, preferably from 15 to 25%, there may be included oxidizing material, such as peroxides, e.g. hydrogen peroxide, or other compounds which react

with portions of the materials in the acidic component compartment to generate heat. Both acidic and basic portions may contain water as a solvent. Normally, the propellant will be in the same compartment as the acidic or major component. Generally, the acidic proportion will be from 2 to 10 times the weight of the basic proportion. Usually, such ratios will be limited by the structure of the available two compartment dispensing containers.

Although catalysts may not be needed to promote the reactions, they may be used. Usually, the neutralization reaction will proceed quickly and stoichiometrically, without the use of any catalyst. Catalysts such as dicyandiamide and melamine will assist in accelerating the reaction of the thioglycolates with the hair. In those cases wherein other systems and other thermogenic agents are employed, suitable catalysts for the particular reactions may be used, too. Among such catalyst are ammonium molybdate for oxidation-reduction reactions, and acids and bases for hydrolysis reactions. No catalysts are normally needed for hydrations.

The depilatories may be made by relatively simple procedures. The components of the different portions of the depilatories may be combined in the usual manner and then, depending on the natures of the ingredients, may be further formulated with either acidic or basic materials to be employed. If the ingredients are either neutral or basic, they may be combined with the base in that portion of the plural-compartment container-dispenser. If acidic or neutral, they may be combined with the acid. As mentioned previously, care should be taken to avoid combining oxidizing and reducing agents or other reactant materials before final dispensing. If so desired, the acidic and basic materials may be kept in separate compartments and the other depilatory composition constituents may be in a third compartment, with the contents of all three compartments being mixed together at the time of final dispensing.

The advantages of the invention are manifold. The contents of the two compartments that reacted together generate heat and produce the active depilatory. The heat generated speeds the depilating action. When a surface active material is present this further aids the depilating agent in making contact with the hair and in acting effectively on it. In many cases, the auxiliary thermogenic material that may be present forms a buffering system that aids in maintaining the desirable high pH, useful for best depilating effects. Such high pH is obtainable by using an excess of basic neutralizing material. The high pH promotes the effective depilating action of thioglycolate or other suitable depilatory. The surface active agent also aids in producing a foam and the foam is useful in maintaining a blanket of insulating gas bubbles over the area of skin to which it is applied, thereby maintaining the heat and moisture inside, in contact with the hair. The presence of a foam allows easy visible application of the depilatory to the area to be treated and permits contact with the hair of an appreciable quantity of depilating agent, borne by the foam. The surface active agent also aids in maintaining the various materials in a homogeneous mixture or dispersion in storage and just before use. Furthermore it facilitates contact of the reacting materials with each other and thereby promotes production of the depilatory salt and generation of heat. All these advantages are are obtained at relatively low cost and with convenient and readily available materials which lend themselves to manufacturing by simple techniques. The products of the thermogenic reaction are not wasted or unnecessary adulterants of the depilatory. Rather, they make active ingredient. The reactions which cause the generation of heat and greatly improve the utility of these products do not add any gas or objectionable solid or liquid to the compositions. The only by-product is water, which is a normal depilatory constituent and which acts as a solvent for the salt produced and other depilatory composition ingredients. Thus, no modification of the depilatory formula is needed to compensate for by-product production and no objectionable changes in physical effects result.

The following Examples ilustrate the invention. Unless otherwise stated, all parts, percentage and ratios in the Examples and elsewhere in the specification are by weight. Percentages are by weight of the whole composition unless otherwise indicated.

EXAMPLE I

	Parts
Thioglycolic acid	16
Acetic acid (glacial)	10
Triethanolamine linear higher (C_{12}—C_{16}) alkyl sulphonate	20
Water	54
Sodium hydroxide (21% aqueous solution)	20
Propellant (7:1 isobutane:propane)	10.5

The thioglycolic acid, acetic acid, triethanolamine alkyl sulphonate and water are mixed together at room temperature, to form a solution. This is filled into the main compartment of a two-compartment aerosol dispenser equipped with a dual valve and two dip tubes. The smaller compartment of the dispenser is filled with the caustic solution. A dispensing valve is staked into place at the outlet of the container and the propellant is pressure filled into the larger compartment. The gas exerts pressure on the contents of both compartments. The smaller compartment, made from a polymeric material (poly-

ethylene), is impervious to the dispenser contents. As soon as the presurizing liquefied gas has been added, the depilatory is ready for use.

The product is of good shelf life and maintains its depilating and thermogenic actions to a significant extent during storage. Although it contains sulphur compounds, the product is pleasant to use, and the heated foam dispensed when the dispensing spout is depressed and the valve ports are opened does not exhibit any significant malodorous characteristics. On dispensing, the depilatory cream or foam is raised to a temperature of about 140° F, and after from 3 to 5 minutes, depending on the nature of the hair, the hair is sufficiently softened, due to rupture of sulphide bonds of the cystine portion of the hair keratin and gelatinization of the protein, to be removed by wiping with a cloth. When perfume is employed, it does not adversely affect the depilating action and makes the odour of the product more pleasant, covering effectively any slight sulphur odour given off. The lather is self-insulating and maintains heat on the hair for about 5 minutes, promoting quicker depilating action.

When various changes are made in this formula, equivalent results are obtained, with minor modifications. For example, when the thioglycolic acid is the sole acidic constituent and 24 parts thereof are employed, with the sodium hydroxide being decreased to 16 parts, the balance of 4 parts being made up with water, preferably deionized water, an even more active depilatory is obtained but the temperature to which the composition is raised on discharging is less, about 130° F. However, hair is removable within about 4 minutes. Similarly, the triethanolamine alkyl sulphonate may be replaced by the same proportions of diisopropanolamine coconut oil alcohol sulphate or nonyl polyoxyethylene ethanol, wherein the polyoxyethylene group is of 30 oxyethylenes, and a good wetting and foaming depilatory is produced. Instead of the alkanolimine salt, the alkali metal or soluble alkaline earth metal and other salts may be employed with similar effect, although the alkali metal salts appear to exert a slightly greater irritating effect against the skin than do salts of alkanolamines. When ammonium hydroxide or potassium hydroxide is employed instead of sodium hydroxide, in equivalent stoichiometric proportion, equivalent heating is obtainable. Instead of sodium hydroxide, triethanolamine may be used as the neutralizing agent. When solid calcium hydroxide or a solid salt is employed as the basic material, care should be taken that the solid is finely enough divided so as not to block valve parts, when dispensed. Various propellants may be used, including mixtures of trichloromonofluoromethane and dichlorodifluoromethane, dichlorotetrafluoroethane, and other hydrocarbon propellants mixtures, in which the proportions may be varied so as to obtain different dispensing pressures.

To supplement the heat-generating action and to improve the surface activity of the product, a heating system such as a toluyl sulphinic acid and hydrogen peroxide or 2,2'-thiodiethanol and a per-compound may be employed. In such cases, the acetic acid—sodium hydroxide reactants will preferably be replaced with an exothermically equivalent proportion of the redox system. The result of using the additional thermogenic system will be a supplemental generation of heat and production of a surface active material, which, when desired, will allow reduction in the proportion used of other surface active agent, such as triethanolamine linear higher alkyl sulphonate. The sulphinic acid will be stored with the thioglycolic acid and the peroxide with the caustic, or additional separate compartments may be used. A redox catalyst may be added to the sulphinate, e.g. sodium tungstate.

The formula shown in Example 1 is a basic formula, without adjuvant materials being present. However, such materials will normally be added to the "acidic component" part of the formula and may include minor proportions, up to 5%, of emollients, humectants, perfumes, colouring agents, skin conditioners, antiseptics, bactericides and fungicides. Care should be taken to minimize the proportion of oily materials present, which might act to inhibit the best contact of active depilating agent and the hair.

EXAMPLE 2

	Parts
Diethanolamine salt of coconut oil fatty acids	20
Polyvinylpyrrolidone (5% aqueous solution)	10
Acetic Acid (glacial)	10
Water	38
Monoethanol amine	10
Propellant mixture (83% isobutane, 17% propane)	10.5
Thioglycolic acid	15

This formulation is prepared in a manner like that described for the product of Example 1. The pressure generated by the liquefied gas propellant forces the alkaline component (the monoethanolamine) through a 0.050 inch inside diameter dip tube and out through the dispensing valve, while the other ingredients, in a separate dispensing zone, including the propellant, are dispensed through a 0.030 inch inside diameter dip tube. The product is a satisfactory foaming depilatory, dispensed at a temperature of about 155° F, but at a pH of only about 10.6. For comparison, it is mentioned that the pH of the product of Example 1 is 12.2. Consequently, the depila-

tion time for the foaming product of Example 2 is significantly longer, several minutes longer, than for the product of Example 1. Since heating appears to compensate for lower depilating temperatures, various amounts of glacial acetic acid may be substituted for the 10 parts of the given formula. Thus, in separate experiments there are employed 0, 5, 15, 20 and 25 parts of acetic acid. It is found that the temperatures of the foams, shortly after dispensing, range from about 135° F to about 165° F, depending on acetic acid content of the cream. At the highest content, there is a lowering of temperature but in the other cases, more acid present causes greater heating. Concomitantly, with the increased acid contents, pH decreases further, from 11 to 10.

When diethanolamine is used as the neutralizing agent and propionic acid as the acid, similar results are obtained, as is also the case with triethanolamine and lactic acid combinations.

EXAMPLE 3

A formula like that of Example 1 is prepared with the exceptions that an alkali-resistant thickening agent, such as a pyrogenic silica, a hydrophilic carboxy vinyl polymer, sodium carboxymethyl cellulose, or sodium alginate is employed to the extent of 1 to 3% to give body to the material being dispensed, and the propellant is housed in an expansible envelope, apart from the rest of the constituents. Thus, the depilatory components are dispensed from the valves and communication spout without foaming caused by an expanding liquefied gas. A similar effect is obtainable by modifying the product of Example 2 in like fashion, using 5% lauric myristic diethanolamide and 2% sodium carboxymethyl cellulose, preferably with about 0.5% of pyrogenic silica added.

By increasing the proportion of thickeners or gelling agents, the thickness of the dispensed product may be made to approach the solid state, especially when the temperatures are somewhat lower. However, of the non-foaming products, usually the higher temperature liquid products will give the best depilating results and, therefore, are much preferred.

Other comparable liquid and gelatinous products may be made by varying the surface active and acidic components of the formulation, as previously indicated. Also, modifications of proportions, within ±10—15%, result in products which are of similar depilating utility.

EXAMPLE 4

The dispensed product of Example 1, a preferred formulation, is compared to a commercial, successful depilatory cream. Comparison is made by suspending identical hairs (from a number of subjects) with weights attached thereto and applying comparable amounts of depilating agents from the commercial and experimental products to points on the hairs above the weights. Times required for the weights to fall are recorded. Previous experiments have established that there is good correlation between such times and depilating activity, the shorter time indicatng greater activity.

By such tests, using five different hair samples to obtain a representative selection, the experimental preparation weakens the hair sufficiently to make it incapable of supporting the weight in a time which is from 1/6 to 1/30 that for the commercial depilatory. This indicates that the experimental products are far superior to a commercial depilatory, a result which is confirmed by actual use of the products and comparisons of the effects thereof.

Although the present depilating compositions are superior to the ordinary depilatories, it is considered that such superiority is mostly due to the self-heating actions thereof, rather than to basic formulation differences or different active depilating agents employed. This view is supported by experiments in which the depilating agent is tested for penetration of a hair at different temperatures, wherein it is found that at temperatures between 75° F and 150° F there is a 25-fold increase in penetrating rate, as determined by a polarizing microscope technique.

WHAT WE CLAIM IS:—

1. A package for dispensing a self-heating depilatory, comprising depilatory compound constituents stored in separate zones of the package, in one of which zones there is present a chemical compounds which is exothermically reactive with another chemical compound to form an active depilatory compound, and in the other zone of which there is present the other chemical compound, and means for dispensing the contents of both zones from these zones and into contact with each other (and other depilatory composition constituents which may be present) to produce a heated depilatory.

2. A depilatory package according to Claim 1 wherein the exothermically reactive compounds are an acid and a base.

3. A depilatory package according to Claim 2 wherein the exothermically reactive compounds are thioglycolic acid and a sodium hydroxide base which react to form sodium thioglycolate.

4. A depilatory package according to Claim 3 wherein the thioglycolic acid and base are in aqueous solutions or dispersions, the means for dispensing is a pressurized gas, a surface acid material is present with the thioglycolic acid, and the depilatory is dispensed as a heated foam.

5. A depilatory package according to any of the preceding claims which also includes an auxiliary heat-generating reactant.

6. A depilatory package according to Claim 5 in which the auxiliary heat-generating agent is a C_2—C_6 alkanoic acid.

7. A depilatory package according to any of the preceding claims wherein there is present from 1 to 25% depilating compound, 1 to 30% surface active material, 10 to 90% water, 2 to 25% liquefied gas propellant, 0 to 25% auxiliary heat-generating reactants and 0 to 25% adjuvants, the pH of the final depilatory being from 9.5 to 12.8, the dispensing pressure being from 20 to 100 p.s.i. and the temperature of the dispensed depilatory being from 100 to 160° F.

8. A depilatory package according to Claim 7 wherein the active depilating compound is made by the interaction of thioglycolic acid and aqueous sodium hydroxide, the surface active material is triethanolamine linear alkyl sulphonate having at least 10 carbon atoms in the linear alkyl group, the propellant is a 1:7 mixture of propane:isobutane, the auxiliary heat-generating reactants are acetic acid and sodium hydroxide, the pH is from 11 to 12.5, the dispensing pressure is from 30 to 50 p.s.i. and the temperature of the depilatory being dispensed is 130 to 145° F.

9. A depilatory package according to any of the preceding claims wherein there is a further active depilating agent in addition to that made by exothermic reaction.

10. A depilatory package according to claim 1, substantially as described in any of the Examples.

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